Flathead Valley Amateur Radio Club

"ELMER'S NIGHT"

WHAT CAN I DO NOW THAT I HAVE MY AMATEUR RADIO LICENSE?

Find a Club:

Absolutely the best way to become active is to join a club. At a club you will find hams involved in various Amateur Radio activities. Each club has it's own flavor and interests. Folks tend to join a club whose members share similar interests. Check out the clubs in your area and find one that is involved with activities that interest you. All clubs welcome guests so visit them and find which one matches your interest, **then GET INVOLVED!** You can't learn to swim until you get your feet wet. Here's a list of local clubs – (in alphabetical order). Volunteer to help with club activities and you will soon find you have some great new friends.

HAM Clubs

Kalispell, MT: Flathead Valley Amateur Radio Club – http://www.fvarc.org/

(Local Nets/meetings/Events)

Billings, MT: Yellowstone Radio Club–www.k7efa.net/

Bozeman, MT: Gallatin Ham Radio Club–gallatinhamradio.com/

Eureka, MT: Tobacco Valley Amateur Radio Club– tvarc.org/

Great Falls, MT: Great Falls Area Amateur Radio Club– www.w7eca.org/

Great Falls, MT: Electric City Amateur Radio Club– w7ecr.org/

Helena MT: Capitol City Amateur Radio Club– ccarc.org/

Joliet, MT: Beartooth Amatuer Radio Club– wb7ris.tripod.com/index.html

Missoula, MT: Hellgate ARC– www.w7px.org/

Hamilton, MT: Bitterroot Amateur Radio Club– w7ftx.tripod.com/

Cranbrook BC: East Kootenay Amateur Radio Club– www.qsl.net/ekarc/

ARRL – National Association for Amateur Radio :

Founded in 1914, the ARRL (Amateur Radio Relay League) is the National Association for Amateur Radio. With approximately 152,000 members (summer 2007), ARRL is the largest organization of radio amateurs in the USA. Visit their website at **http://www.hello-radio.org/whatis.html** -or- **http://www.arrl.org**. The website contains a wealth of Amateur Radio news, events and information. The ARRL umbrella also includes many branches that are basically organizations themselves covering specific areas of interest. You may be interested in some of the following examples – visit the websites for complete information.

Info for New Hams-ARRL-http://www.arrl.org/get-on-the-air

Guide to Amateur Radio for New Hams-http://www.eham.net/newham/index

Study Source for Upgrading License-http://www.hamradiolicenseexam.com/

==Ethics and Operating Procedures for the Radio Amateur==-
http://www.arrl.org/files/file/DXCC/Eth-operating-EN-ARRL-CORR-JAN-2011.pdf

Where to go for info on:

Used Ham Radio Equipment-QTH.com/

Call Sign Lookup-QRZ.com

Band conditions/ Activity- www.pskreporter.info/pskmap.html **or** www.dxmaps.com/spots/map.php?Lan=E&Frec=28&ML=M&Map=W2LN&DXC=N&HF=S&GL=S

HF/VHF/UHF and other Ham Radio Equip Reviews-www.eHam.net/

Ham Radio Nets You Might be Interested In

VHF/UHF Local Area Nets- http://www.fvarc.org/?q=nets

HF Net Listings- http://www.n1yz.com/HFNET_LIST.HTM

Prepper's Radio Information Resources- http://www.amrron.com/

Ham Nation- Internet Television—Very Good Information for all Hams-
http://wiki.twit.tv/wiki/Ham_Nation

Other organizations, activities and Interests:

There are so many facets to the Amateur Radio Service (Ham Radio) that very few hams ever experience them all. Pick the ones you are most interested in and start learning about them. As you gain experience you will probably become interested in other aspects of this avocation and expand your horizons. Some activities are listed below.

NOT JUST FOR MEN…

Young Ladies' Radio League: http://www.ylrl.org/index.php/about-us/ylrl-information

The YLRL (Young Ladies' Radio League) exists to encourage and assist YLs (Young Ladies) throughout the world to enter into the Amateur Radio Service. There are a variety of interests to offer licensed YLs: Traffic Handling, Public Service, ARES, Contests, Awards, DX, etc., on AM, CW, SSB, FM, RTTY, AMTOR, Packet and Satellite. You are always welcome in any YLRL activity. Come on in—the YLs are anxious to meet you!

Public Service Events: http://www.hampublicservice.org & http://www.rars.org/public-service

Learn to use Ham Radio communications by supporting Public Service events in North Carolina.

Walkathons, marathons, bike events, parades, etc. are good training for emergency operation procedures. They provide an opportunity to exercise your HT or other portable equipment and they are a fun way to meet other Amateur Radio Operators.

FOX HUNTS (Hidden transmitter hunts)

http://www.arrl.org/tis/info/direction-finding.html and http://home.earthlink.net/~nadia1/

Fox hunting is a fun activity that can be as informal as a few hams getting together as individuals or as clubs with teams using directional antennas to locate the transmitter (FOX), or as formal as the National Amateur Radio Direction Finding organization with "international style" fox hunting combining orienteering with direction finding.

IRLP http://www.irlp.net/   and   ECHOLINK http://www.echolink.org/

These are modern communications methods that allow you to extend the range of your ham radio over the Internet to virtually any corner of the world. IRLP is the Internet Radio Linking Project and allows radios (usually repeaters) to be linked together. If your local repeater can be linked via the IRLP to a repeater in Australia then you can talk over the local repeater to someone using the repeater in the distant location. ECHOLINK is similar but you are not restricted to repeater operation, or even to having a radio on each end. By installing the ECHOLINK software on a computer with internet access you can

get on the ECHOLINK system and "connect" to any radio, repeater, or even another PC that is also on the ECHOLINK system. Then using the microphone connected to your sound card you can talk on the distant repeater directly from your computer.

Linked Repeater Systems http://www.kd4raa.net/ and http://www.caryncrepeater.com/

Here in the Triangle area of NC we have available one of the largest linked repeater networks to be found. You can talk from most areas in the Triangle clear to the east coast by entering a few codes from your HT to link the repeaters together. The network has more than 20 repeaters with full time links, and meny other repeaters can be linked at any time by users. The system also has IRLP access.

AMSAT – The Radio Amateur Satellite Corporation – http://www.amsat.org

For nearly 40 years Amateur Radio operators have been putting satellites in orbit and using them as repeaters to communicate around the world. Some provide real time communications using CW or Phone communications while others are designed to "Store and Forward" digital communications (like email). While most satellites require HF equipment there are several today that support VHF and UHF voice communication.

ARISS – Amateur Radio on the International Space Station - http://www.arrl.org/ARISS/

ARISS is jointly sponsored by the ARRL, AMSAT, and NASA. Many of the astronauts aboard the International Space Station are Amateur Radio operators who spend time talking to Hams on the ground. You don't need lots of fancy equipment - contacts have been reported using nothing more than a VHF/UHF mobile radio or an HT. ARISS originally started as The Shuttle Amateur Radio Experiment (SAREX) in 1983 allowing Amateur Radio operators (usually clubs) to provide demonstrations in school classrooms where students can speak over Ham Radio to the astronauts.

ATV – Amateur Television - The Triangle ATV Association - http://www.qsl.net/tri-atv/

ATV is the big brother to SSTV. It's exactly like the TV signals we have used at home for years to watch soap operas, the news, Star Trek, and even Roy Rogers but they are sent over Amateur Radio frequencies instead of the commercial TV frequencies. Like commercial TV, these broad signals use about 6 MHz per channel. They can't be used on the HF and VHF because none of those bands are big enough to support a TV signal. UHF frequencies or higher are used but those frequencies don't usually propogate very far so ATV repeaters are used to enable communication over a wider area.

Contesting - http://www.contesting.com/

There are too many kinds of contests to cover here. Most are based on making the most contacts over a specific time period, or over a given geographic area, or using a specific type of transmission, on specific frequency bands, frequency measurement, low power operation, etc. It's.probably inmpossible to find a weekend when there is not at least one contest on the air.

Operating Awards – http://en.wikipedia.org/wiki/Amateur_radio_operating_award

Many Amateur Radio organizations and clubs sponsor awards. These are similar to contests but typically do not have "winners". Instead they have specific qualifications that must be met to earn the award such as making some minimum number of contacts on the local repeater, or participating in some number of club events, etc. These awards vary widely between different organizations.

DX operations http://www.wilowud.net/radio/radiod.html and http://www.arrl.org/w1aw/dx/

Webster references DX as "**: DISTANCE -** used of long-distance radio transmission".

Amateur Radio operators use the term DX to mean speaking to Hams in other countries and call themselves DXers. Most Dxers are working toward DX Awards offered by ARRL, CQ, and other organizations. Many of the DX contacts are made in DX contests.

Hamfests – http://www.rars.org/hamfest and http://www.arrl.org/hamfests.html

You simply can't call yourself a real Ham until you have attended a few "Hamfests"complete with Boneyards and Boat Anchors. A hamfest is an event where hams come together to swap lies, swap equipment, brag about their latest radio contacts, look at the latest displays from new equipment dealers, sell their old equipment, socialize, see demonstrations of new technologies, meet folks face to face that they have only talked to on the radio, upgrade their license at a VE test session, renew aquaintenances with hams they haven't seen lately, talk, etc. etc. etc. Hamfests can be as small as a dozen hams in a parking lot with their equipment for sale in the trunk of their car (usually called a tailgate or swapfest), or as large as the Dayton Hamvention which draws an attendance of over 20,000 each spring. The "Boneyared" (Flea Market) is an area where hams sell their used equipment and parts. This often is where you will find the "Boat Anchors" (old equipment) which, if they are still in usefull condition, will usually be called Antiques. Clubs sponsoring Hamfests in the Raleigh area include RARS, JARS, CARC, and DFMA (see the club listings above).

GLACIER –WATERTON HAMFEST- http://www.gwhamfest.org/

(The Third Weekend in July)

Amateur Radio License Classes - http://www.arrl.org/FandES/courses

Helping other folks become Amateur Radio Operators can be a very rewarding activity. Check with your local clubs to find out how you can become involved in License Classes.

Volunteer Examiners (VE) programs.
http://wireless.fcc.gov/services/index.htm?job=licensing_5&id=amateur

Since 1983 the FCC no longer administers license exams for the Amateur Radio Service.   The FCC now puts this responsibility on the Volunteer Examiner Coordinators (VECs). There are more than a dozen VECs today and all would welcome you to join one of their VE teams. Check with local clubs to see which VEC local teams are associated with. You can also find more informatin including a list of VECs with contact information on the FCC website at the link shown above.

FIELD DAY – http://www.arrl.org/contests/announcements/fd/

Field Day is an annual emergency operating event sponsored by ARRL. Every year on the 4 Saturday of June hams all over the country begin a 24 hour emergency test. starting. Individuals and Ham Radio clubs head for the open country and set up under emergency conditions. The purpose is to prove their ability to communicate "in the field" on emergency power using quickly assembeled stations and antennas –but there is usually a lot of socializing as well. Field Day is undoubtedly the biggest operating event of the year.

Check **FVARC .org** for this year's **FIELD DAY** Activities and Location

QRP – Low Power Operation - http://www.arrl.org/tis/info/qrphome.html

QRP is the "art" of making contacts with low power transmissions- typically 5W or less output power.   It can be challenging to make contacts with less than 5 watts of power when you are competing with other operators running 1000 watts. Some QRP operators build their own inexpensive QRP transmitters in matchboxes and tuna cans or from readily available kits (search for QRP KITS on the internet). There are many clubs that design and build such kits and here in the Triangle area of NC you can start learning about kit building and QRP (Low Power operation) by checking out the KnightLites club at **http://www.knightlites.org.** QRP operation is especially popular with CW operators due to the ability to reach greater distances with CW - *and don't forget that the Technician license allows operating CW on some of the HF bands*. Interesting websites:

1. http://qrpzone.com/
2. http://www.qrparci.org/

Homebrew – (not the kind you drink) - http://www.arrl.org/tis/info/bldgeqp.html

Many amateurs still enjoy building their own equipment today. While few have the equipment needed to build state of the art tranceivers like the commercial rigs costing thousands of dollars, there are still plenty of smaller projects that can be fun to build and there are plenty of simple projects from antennas, antenna tuners, and baluns – to large projects like tranceivers and amplifiers.

Software Defined Radio - http://www.sdrforum.org/

In the last few years another homebrew opportunity has been developing in the form of "Software Defined Radio" (SDR). Just like todays automobiles, modern radios integrate RF components with computers to control the circuits. In recent years radio manufacturers have included computer interfaces that (with appropriate software) allow you to control the radio from a computer screen instead of the front pannel on the radio. This opened up the possibility of remote control of an HF rig using a computer over a phone line or the internet. Some radios were even available with no control panel at all!. Now, in the last few years the latest development is completely removing the computer from the radio and replacing it with your PC. The manufacturer provides the software to run on your PC so you "see" the radio control panel on your PC screen and control it with your keyboard and mouse. Having the software on your PC means upgrades new features can be made available by simply downloading the latest software. And if you have a talent for programming you can even modify the software or write your own to suit your own requirements. Additional Links:

        a.   http://www.hamradioscience.com/resources/
        b.   http://openhpsdr.org/
        c.   http://www.rtl-sdr.com/

RTTY – Radio Teletype - http://www.aa5au.com/rtty.html

The only Amateur Radio digital mode older than RTTY is CW. Teletype (TTY) was one of the earliest forms of digital communication that could be sent and received via automation (the first was the ticker-tape). A TTY machine generates DC pulses that are sent over a wire "current loop" from one TTY to another. Amateur Radio operators eliminated the wire by building a device to convert the DC pulses from the TTY machines into tones, then sending the tones over an Amateur Radio. At the receiving end the tones were converted back to DC pulses and sent to the TTY machine. With TTY speeds of 60 to 100 words per minute the resulting RTTY bandwidth is narrow enough to be alowable on the Amateur HF bands. Today the TTY machines have been replaced by computers with soundcards, but there are still lot's of RTTY operators on the air. While your PC sound card can be used for any of the digital modes, there are also some external PC to Radio interfaces that can provide more control and possibly better performance than the sound card (and leave it available for music).

PACKET - http://k4hm.net/packet_primer.html

Packet was the first mode that allowed transmission of ASCII digital data from a PC over the Amateur Radio frequencies. Before the internet - there used to be many Bulletin Board Systems (BBS) accessible via packet allowing sending text messages to other users mailboxes (much like email today) and posting of information and downloadable text files on the host Bulletin Board. Messages and bulletins were forwarded between BBS all over the country – all via Amateur Radio transmissions. Today the BBS are almost all gone and packet it is mostly used for keyboard to keyboard communications. Packet is still the basis of the APRS systems in use today. While the internet page above needs to be brought up to date, and was written specifically for a club in Alabama, the basic information is still the same (packet is still packet) and for some reason it remains a favorite of mine (could it be because I wrote it ?)

APRS – Automatic Position Reporting System – http://www.aprs.org

APRS uses Packet Radio (see above) to send digital position information (usually from a GPS device), weather information (from a home weather station) and messages between users. You could put an APRS enabled transmitter (maybe a cheap HT) and a GPS in the trunk of your car and then you can track the location of your car in real time via an APRS station at home or from an APRS web site - and so can anyone else with an internet connection or APRS station. (This can be handy if your car is stolen, but it can also lead thieves to your mobile rig.). The main difference between APRS and the earlier Packet systems is that the protocols used for most Packet activity is to be 2 party point-to-point communications, but APRS is a "broadcast" type of protocol where one transmission is intended to go to all stations on the network.

SSTV – Slow Scan Television - http://www.hamuniverse.com/sstv.html

Slow Scan TV is a method of sending still pictures over the Amateur Radio frequencies. It requires a PC and an amateur radio on each end. Typically software is used to "scan" a picture into digital format which is then stored on the PC. Software can then send the file as a digital stream to the sound card which converts the data stream to tones which are then sent to audio input to an amateur radio transmitter. On the other end the Amateur Radio receiver sends the received tones to the input of the sound card which converts it back to a digital stream for the computer software to display as a picture on the screen. This is the same process as sending files between two computers using a modem and phone line. The sound card provides the modem function and the radio replaces the phone line. The FCC limits the bandwidth of this type transmission so it is not fast enough for moving pictures like you get on your home TV, its more like a slide show with pictures painted line by line down the screen in slow motion, but the limited speed means a narrow bandwidth which allows it to be used on HF where using just your PC, some free software, and your HF radio the signal can go around the world to display your picture, or QSL card, to a distant operator. In some areas SSTV is also popular using VHF and UHF radios.

PSK, AMTOR, PACTOR, and more. http://www.wb8nut.com/digital.html

It seems like lately there is a new digital mode being invented every month! Well, not quite but in recent years there have been quite a few, and every time one comes out it seems to get reinvented in short order with newer, better features. But that's the Amateur Radio spirit! And it is not a problem because the new version can be used by just downloading some new software for your PC. Some digital modes use error correcting protocols so the software verifies accurate reception which is great for important messages (think emergency operations). However this means that under poor conditions the transmissions often have to be repeated several times before the software can verify accurate reception. You can learn what features are different by exploring the web site above.Digital Modes

Information Page- http://wb8nut.com/digital/

Downloadable Digital Software to consider:

- **Digipan**: http://www.digipan.net/   Digipan Helps- http://www.qsl.net/wm2u/digipan20.html
- **FLdigi** : http://sourceforge.net/projects/fldigi/ FL digi Helps- http://www.ground-tech.com/fldigi_setup1.htm
- **Ham Radio Deluxe**: http://hamradiodeluxefreedownload.myfileget.com/
  Ham Radio Deluxe-*(great software but is complex and uses computer resources)*

FVARC APPENDIX Docmuents

Communicating with Other Hams

Ham Radio Station Log (Copy and Use for Station Log)

US Amateur Radio Band Plan

Developed by

Gary Roberts-KF7VQO

Communicating with Other Hams

Contact Basics: Good Amateur Practices

Q-Signals

Q-signals are a system of radio shorthand as old as wireless and developed from even older telegraphy codes. Q-signals are a set of abbreviations for common information that save time and allow communication between operators who don't speak a common language. Modern ham radio uses them extensively. The table below lists the most common Q-signals used by hams. While Q-signals were developed for use by Morse operators, their use is common on phone, as well. You will often hear, "QRZed?" as someone asks "Who is calling me?" or "I'm getting a little QRM" from an operator receiving some interference or "Let's QSY to 146.55" as two operators change from a repeater frequency to a nearby simplex communications frequency.

Q-Signals

Abbr.	Questions
QRG	Your exact frequency (or that of _____) is _____kHz. Will you tell me my exact frequency (or that of _____)?
QRL	I am busy (or I am busy with _____). Are you busy? Usually used to see if a frequency is busy.
QRM	Your transmission is being interfered with _____ (1. Nil; 2. Slightly; 3. Moderately; 4. Severely; 5. Extremely.) Is my transmission being interfered with?
QRN	I am troubled by static _____. (1 to 5 as under QRM.) Are you troubled by static?
QRO	Increase power. Shall I increase power?
QRP	Decrease power. Shall I decrease power?
QRQ	Send faster (_____wpm). Shall I send faster?
QRS	Send more slowly (_____wpm). Shall I send more slowly?
QRT	Stop sending. Shall I stop sending?
QRU	I have nothing for you. Have you anything for me?
QRV	I am ready. Are you ready?
QRX	I will call you again at _____hours (on _____kHz). When will you call me again? Minutes are usually implied rather than hours.
QRZ	You are being called by _____ (on _____kHz). Who is calling me?
QSB	Your signals are fading. Are my signals fading?
QSK	I can hear you between signals; break in on my transmission. Can you hear me between your signals and if so can I break in on your transmission?
QSL	I am acknowledging receipt. Can you acknowledge receipt (of a message or transmission)?
QSO	I can communicate with _____ direct (or relay through _____). Can you communicate with _____ direct or by relay?
QSP	I will relay to _____. Will you relay to _____?
QST	General call preceding a message addressed to all amateurs and ARRL members. This is in effect "CQ ARRL."
QSX	I am listening to _____ on _____kHz. Will you listen to _____on _____kHz?
QSY	Change to transmission on another frequency (or on _____kHz). Shall I change to transmission on another frequency (or on _____kHz)?
QTC	I have _____messages for you (or for _____). How many messages have you to send?
QTH	My location is _____. What is your location?
QTR	The time is _____. What is the correct time?

ITU Phonetic Alphabet

Letter	Word	Pronunciation
A	Alfa	**AL** FAH
B	Bravo	**BRAH** VOH
C	Charlie	**CHAR** LEE
D	Delta	**DELL** TAH
E	Echo	**ECK** OH
F	Foxtrot	**FOKS** TROT
G	Golf	GOLF
H	Hotel	HOH **TELL**
I	India	**IN** DEE AH
J	Juliet	**JEW** LEE ETT
K	Kilo	**KEY** LOH
L	Lima	**LEE** MAH
M	Mike	MIKE
N	November	NO **VEM** BER
O	Oscar	**OSS** CAH
P	Papa	PAH **PAH**
Q	Quebec	KEH **BECK**
R	Romeo	**ROW** ME OH
S	Sierra	SEE **AIR** RAH
T	Tango	**TANG** GO
U	Uniform	**YOU** NEE FORM
V	Victor	**VIK** TAH
W	Whiskey	**WISS** KEY
X	X-Ray	**ECKS** RAY
Y	Yankee	**YANG** KEY
Z	Zulu	**ZOO** LOO

Note: The **boldfaced** syllables are emphasized. The pronunciations shown in this table were designed for those who speak any of the international languages. The pronunciations given for "Oscar" and "Victor" may seem awkward to English-speaking people in the US.

HAM RADIO LOG OF STATION_____

CALL	DATE/TIME	FREQ/MODE	MY RST	HIS RST	QTH	Name	Comments

US Amateur Radio Bands

US AMATEUR POWER LIMITS

FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

Effective Date March 5, 2012

160 Meters (1.8 MHz)

Avoid interference to radiolocation operations from 1.900 to 2.000 MHz

E,A,G

1.800   1.900   2.000 MHz

80 Meters (3.5 MHz)

3.500 3.600   3.700   4.000 MHz

E
A
G
N,T
(*200 W*)

3.525 3.600   3.800

60 Meters (5.3 MHz)

2.8 kHz

E,A,G
(*100 W*)
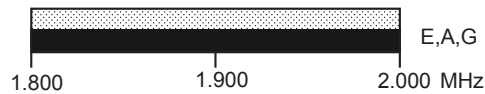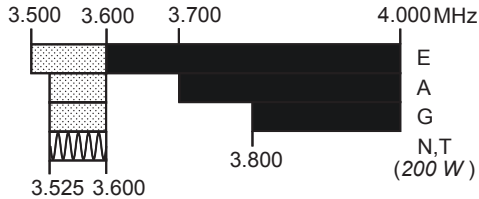
5330.5 5346.5 5357.0 5371.5   5403.5 kHz
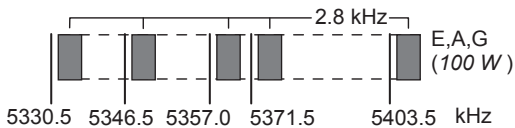
General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated output of 100 W PEP. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III as defined by the FCC Report and Order of November 18, 2011. USB is limited to 2.8 kHz centered on 5332, 5348, 5358.5, 5373 and 5405 kHz. CW and digital emissions must be centered 1.5 kHz above the channel frequencies indicated above. Only one signal at a time is permitted on any channel.

40 Meters (7 MHz)

7.000   7.125   7.300 MHz

E
A
G
N,T
(*200 W*)

7.025   7.125   7175
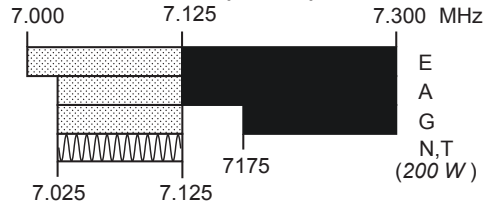
Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11).
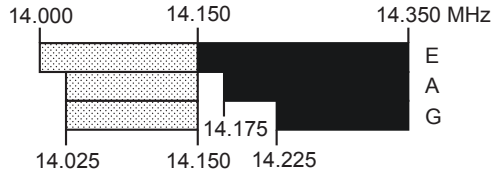Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz and between 7.100 and 7.125 MHz. 7.200 to 7.300 MHz is not available outside ITU Region 2. See Section 97.301(e). These exemptions do not apply to stations in the continental US.
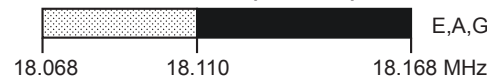
30 Meters (10.1 MHz)
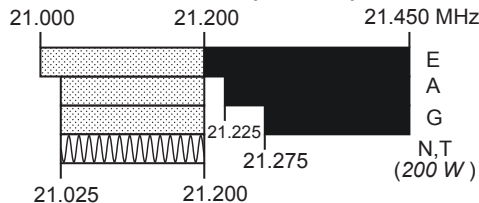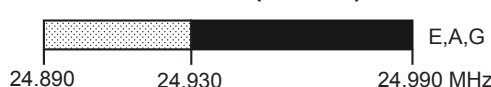
Avoid interference to fixed services outside the US.

200 Watts PEP   E,A,G

10.100   10.150 MHz

20 Meters (14 MHz)

14.000   14.150   14.350 MHz

E
A
G

14.025   14.150   14.225
14.175

17 Meters (18 MHz)

E,A,G

18.068   18.110   18.168 MHz

15 Meters (21 MHz)

21.000   21.200   21.450 MHz

E
A
G
N,T
(*200 W*)

21.225
21.275
21.025   21.200

12 Meters (24 MHz)

E,A,G

24.890   24.930   24.990 MHz

10 Meters (28 MHz)

28.000 28.300   29.700 MHz

E,A,G
N,T
(*200 W*)

28.000   28.500

6 Meters (50 MHz)

50.1

E,A,G,T

50.0   54.0 MHz

2 Meters (144 MHz)

144.1

E,A,G,T

144.0   148.0 MHz

1.25 Meters (222 MHz)

E,A,G,T
N (*25 W*)

219.0 220.0   222.0   225.0 MHz
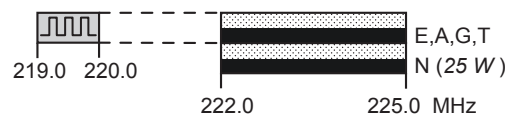
* Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.
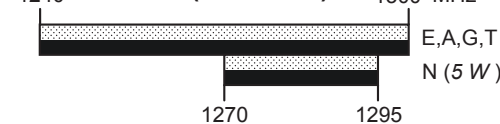
70 cm (420 MHz)*

E,A,G,T

420.0   450.0 MHz

33 cm (902 MHz)*

E,A,G,T

902.0   928.0 MHz

23 cm (1240 MHz)*

1240   1300 MHz

E,A,G,T
N (*5 W*)

1270   1295

All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz *	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

* No pulse emissions

KEY

Note:
CW operation is permitted throughout all amateur bands.

MCW is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz

= RTTY and data

= phone and image

= CW *only*

= SSB phone

= USB phone, CW, RTTY, and data.

= Fixed digital message forwarding systems *only*

E = Amateur Extra
A = Advanced
G = General
T = Technician
N = Novice

See *ARRLWeb at www.arrl.org* for detailed band plans.